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7 May 1965

Please Reference:
A51-65-3246Declass Review by
NIMA/DOD

Gentlemen:

We are pleased to provide the ninth in a series of Monthly Progress Reports covering the effort expended on subject contract during the period of April 2, 1965 to May 1, 1965.

Clean Room Erection:

As previously reported all major work for the installation for the clean rooms is complete. The outstanding work may be separated into two phases;

1. Clearing of Quality Control Inspection queries.
2. Qualifying the performance of the clean room to meet the contract requirements.

Work by to satisfy and clear inspection snags is proceeding, and is scheduled for completion by May 8th.

Daily record charts of the performance of the control equipment shows variations outside the contractual requirements of maintaining any selected temperature between the range of 68°F. and 85°F. within $\pm 2^\circ\text{F.}$ and 45% relative humidity within $\pm 5\%$. An evaluation of the whole system has been conducted by the sub-contractors concerned, and modifications as necessary put into effect. These changes included the de-sensitizing of the pneumatic control system to eliminate transients and the addition of a damper control over the fresh air intake. The system was designed to accommodate a working load of the HTA/5 processor plus lighting and a maximum working personnel load of 15 with approximately 60 changes of air per hour. Modifications are therefore required to reduce the outside air intake to compensate for the load of this load. Additional heater strips are also being

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installed to assist control of relative humidity. These modifications are scheduled for completion by May 10. A final scrubbing, washing down, and cleaning of the rooms is scheduled for the week ending May 16, 1965. The final acceptance tests to demonstrate the performance of the installation to specification is scheduled for the week ending May 23, 1965.

Research Program:

1. The following assignments were continued during this reporting period;



- Evaluation of the effect of elevated processing temperatures on emulsions.
- To determine the coefficient of friction of film.
- Design and testing of air bearings.
- Liquid bearing incorporating a built-in pump.

2. - During this reporting period of the contract, film type 5427, derographic duplicating was tested in continuance of the elevated temperature processing studies. The leading particulars of this film are as follows:

- | | | |
|-------------------------|---|---|
| Base thickness | - | 5.2 mils, acetate butyrate without gel backing. |
| Emulsion thickness | - | 0.42 mils. |
| Sensitivity | - | Blue sensitivity, fine grain emulsion. |
| RMS Granularity | - | Kodak developer DK-50 .043 (D net = 1.0)
Kodak Developer D-76 .037 |
| Resolving Power | - | T.O.C. 1000:1 141 lines/mm-DK-50
135 lines/mm-D-76
T.O.C. 1.6:1 55 lines/m/m-DK-50
63 lines/m/m-D-76 |
| Relative printing speed | - | About twice the speed of Kodabromide paper No. 2 or Kodak Rapid paper N-2. |

The instrumentation used for these tests is that reported in the Interim Progress report under

Many problems have been encountered during the research on the behavior of film, type 5427 during elevated temperature processing. During the

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preliminary testing of the emulsion, it was apparent that as the processing temperature increased, the more unstable the emulsion reacted in terms of gamma. This result suggests that the rigid standards set for this research program, may require relaxing to accept the lack of stability in the high temperature processing of this emulsion.

The published data on this film establishes that a gamma of 1.90 would be obtained for an 8 minute process in D-76 at 68°F. Using this process as the control, a series of five tests were performed yielding an average gamma of 2.81. The gamma difference between the highest and lowest product of all the tests was 0.10, which falls within the tolerance of ± 0.10 laid down for this program.

In the case of film samples processed for 45 seconds at 118°F., an average gamma of 2.37 was produced, and the difference between the highest and lowest gamma was 0.29, well beyond the required tolerance of ± 0.10 . In the next reporting period the processing time at 118°F. will be increased to the point at which the gamma equals that of the control sample (2-81). Once this is accomplished, further tests will be performed to determine if a time/temperature combination can be found to produce a result within the required tolerance (± 0.10).

The increase in processing temperature from 68°F. to 118°F. resulted in a sharp increase in chemical fog (base + fog) from .05 to .17. To determine the repeatability of the results many replicate tests will be necessary.

- 25X1
3. Assignment - This assignment has been completed, the data reduced and the final report prepared and in printing. This report will be submitted shortly under separate cover.
- 25X1
4. Assignment - Preliminary drawings have been made for an air bearing in which a blower is an integral part of the bearing. Manufacture of parts is expected to commence as soon as detail drawings are available.
- 25X1
5. Assignment - A series of pressure determinations at each of the 161 holes in the plastic plenum mounted on the bearing was completed for three different motor speeds - 296, 357 and 420 rpm. The latter proved to be approximately the limit for reading on the new inclined manometer. The manometer had a slope ratio of 4.123:1 and was filled with C.P. carbon tetrachloride (specific gravity 1.585) for fluid. The water above the legs was tinted with blue dye to facilitate reading the meniscus to 0.01". The slight solubility of carbon tetrachloride caused some turbidity at the interface after a few hours operation, so the instrument was cleaned and the solution replaced for each run.

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The manometer was leveled and its zero reading adjusted to coincide with the rotary shaft centerline for the series of tests. The hydraulic head (distance to the surface of the water in the tank) was accurately measured at the start and maintained constant during the tests by small additions of water to replace dragout and evaporation. The distance of each row of tapped pressure holes above the datum plane was recorded for a correction factor.

The data has not been completely reduced from inches of water (corrected from the carbon tetrachloride gravity) to pounds per square inch as yet, since considerable tedious mathematics is required. However, the interrelated ratios will not be changed and some interesting hypotheses can be formulated. As a generalization on all three runs, the pressure pattern had a characteristic conformation. If observed from the front end (blades moving in a clockwise direction), there was a sharp pressure area along the edge of the 120° masking plate at the bottom of the stator cage. This fell off somewhat and then built to a maximum at the top (according to its design parameter) and continued with some fall-off around to the trailing edge. It is a reasonable conjecture that this pressure pattern may be the cause of the fluctuations (or loping) formerly observed when the bearing was supporting a film loop. This supposition should be tested. It should be noted that this loping effect was virtually eliminated by the addition of a perforated screen which is discussed further on.

It is interesting to note that wherever an individual reading was lower than the points surrounding it, this phenomenon was repeated at each of the other speeds. It is proposed to make some three-dimensional plastic models of the pressure field so that interrelations can be observed in context. Some surge was noted in the manometer readings, particularly at the lower speeds and near the outer edges of the plastic plenum where the velocity gradient fell off. This amounted to approximately $\pm .15$ average at 296 to ± 10 inches at 320 rpm. On the other hand, there were occasional slow surges of an inch or more at all speeds examined at the edges of the plenum. These will be investigated.

If the velocity is assumed to be identical to impellor speed, the observed pressure readings follow almost exactly the square of the velocity law. This gives added credence to the readings. Several point checks were made for pressure lift and these followed closely the observed measurements for 4-, 7-, and 11-pound spool weights tested earlier in the program at speeds of about 280 to 425. In one test, the hydraulic head was allowed to fall to a point at which the pressure pattern closely approached that

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shown in one of the photographs in the February Interim Report. When the room was darkened, a strobe light adjusted to blade speed showed the various flow patterns, area of cavitation and inlet and outlet stream paths. Some photographs of this effect will be attempted.

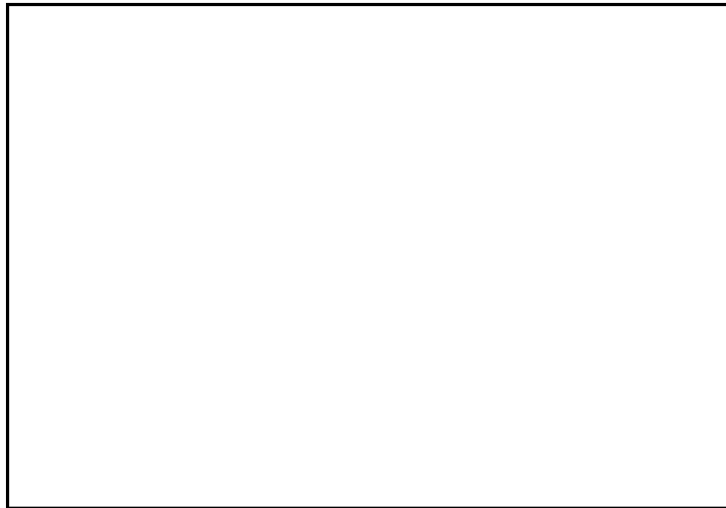
In the next reporting period additional tests will be performed with the perforated aluminum stabilizing screen added. Thereafter a series of tests in which the helix-spring cage is replaced with a plastic cage will be conducted. This latter series of tests will enable us to machine the cage as required to obtain the most satisfactory configuration.

Funds committed or expended to date exclusive of G&A are approximately



If you should have any questions or desire further information please do not hesitate to contact us.

Very truly yours ,



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CONTRACT INSPECTION REPORT			CONTRACT NO.		TASK NO.																														
TO: ENGINEERING SECTION/CB/PD/OL			DATE 8 May 1965																																
			INSPECTION REPORT NO. (If final, so state) 6																																
			ESTIMATED COMPLETION DATE 30 June 1965																																
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TYPE OF COMMODITY OR SERVICE 																																			
File Processor Development Program																																			
THE CONTRACTOR IS ON SCHEDULE <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO			THE CONTRACTOR WILL PROBABLY REMAIN WITHIN ALLOCATED FUNDS <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO IF ANSWER IS "NO" ADVISE RECOMMENDATION AND/OR ACTION OF SPONSORING OFFICE, ON REVERSE HEREOF. IF KNOWN, INDICATE MAGNITUDE OF ADDITIONAL FUNDS INVOLVED.																																
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HAS AN INTERIM REPORT, FINAL REPORT, PROTOTYPE, OR OTHER END ITEM BEEN RECEIVED FROM THE CONTRACTOR DURING THE PERIOD? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO (If yes, give details on reverse side.)																																			
HAS GOVERNMENT-OWNED PROPERTY BEEN DELIVERED TO CONTRACTOR DURING THIS PERIOD? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO (If yes, indicate items, quantity, and cost on reverse side.)																																			
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IF TERMINATION IS RECOMMENDED OR IF THIS IS A FINAL REPORT PUT COMMENTS ON REVERSE IN NARRATIVE FORM ON CONTRACTOR'S PERFORMANCE AND CERTIFY THAT ALL DELIVERABLE ITEMS UNDER THE CONTRACT HAVE BEEN RECEIVED. THESE INCLUDE, WHERE APPLICABLE, THE FOLLOWING:																																			
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